Attachment A 1/3

[0208] While the description below focuses on inspection of the wooden pallet P, the same detection method applies to the plastic pallet P' as well. The crack detection device J, as Figure 1 shows, is arranged above the rot detection device H.

[0209] In Figure 40, the crack detection device J has 4 lighting devices J4 to illuminate the inspection surface J3 of the wooden pallet P, 1st to 4th cameras $J7_{-1}$ to $J7_{-4}$ to image sub inspection surfaces $J5_{-1}$ to $J5_{-4}$ when the inspection surface J3 is divided into 4 sub inspection surfaces $J5_{-1}$ to $J5_{-4}$ and to produce 1st to 4th image signals $J6_{-1}$ to $J6_{-4}$, a data input device such as keyboard, etc. not shown in the figure, and a data output device such as printer, etc. not shown in the figure; and it also incorporates an image process device J8 to perform various image processing jobs to be described later based on the 1st to 4th image signals $J6_{-1}$ to $J6_{-4}$, a display J9 to display the results, etc. from the image process device, and a background panel J10 painted black and arranged at a position that functions as a background of the inspection surface J3 viewed from the 1st to 4th cameras $J7_{-1}$ to $J7_{-4}$.

[0210] In Figure 41, the inspection surface J3 of the wooden pallet P has sub inspection surfaces $J5_{-1}$ to $J5_{-4}$ divided by a 1st virtual dividing line JL1, positioned in parallel to the pallet loading direction to divide the inspection surface J3 asymmetrically (4:3 in the figure), and by a 2nd virtual dividing line L2 (sic), positioned vertically to the 1st virtual dividing line JL1 to divide the inspection surface J3 symmetrically (1:1), in order to thoroughly inspect a front deck board 1 subject for inspection.

[0211] The sub inspection surface $J5_{-1}$ is imaged by the 1st camera $J7_{-1}$; the sub inspection surface $J5_{-2}$ is imaged by the 2nd camera $J7_{-2}$; the sub inspection surface $J5_{-3}$ is imaged by the 3rd camera $J7_{-3}$; and the sub inspection surface $J5_{-4}$ is imaged by the 4th camera $J7_{-4}$.

[0212] This design, wherein the inspection surface is divided into 4 sub inspection surfaces $J5_{-1}$ to $J5_{-4}$ to be imaged by their corresponding cameras $J7_{-1}$ to $J7_{-1}$ (sic), is intended to prevent the resolution (process resolution) from declining when the inspection surface J3 of the wooden pallet P is imaged by a single camera as well as to prevent the system from increasing in size since the camera needs to be positioned away from the wooden pallet P.

[0213] Thus, the number of sub inspection surfaces can be determined by the resolution needed, system dimensions, and costs, etc. Figure 42 is a flow chart for an inspection process.

[0214] The wooden pallet P subject for inspection is transferred by the conveyer V4 to the inspection position, where the inspection surface J3 of the wooden pallet P is illuminated by the 4 lighting devices. Concurrently, the sub inspection surfaces $J5_{-1}$ to $J5_{-4}$ are imaged by their corresponding 1st to 4th cameras $J7_{-1}$ to $J7_{-4}$, and the resulting 1st to 4th image signals $J6_{-1}$ to $J6_{-4}$ are forwarded to the image process device J8. Upon receipt of the signals, the image process device J8 defines a reference binarizing or quantizing level per one half of each of the front edge boards 1A and front deck boards 1 (step S1).

[0215] This allows for optimum quantization (binarization) for wooden pallets subject to specific problems; for example, when new and damaged pallets are mixed; when the surface colors of identical pallets are significantly different since some are dry and others

contain moisture; or when the surface colors of the same boards are significantly different depending on the location.

[0216] More specifically, as Figure 43 shows, color detection areas are created on each of the front deck boards 1 and front edge boards 1A (4 areas are created per board in the figure); based on a predetermined initial reference binarizing level, the pixels within the color detection areas are classified into white dots (higher brightness than the initial reference binarizing level) and black dots (lower brightness than the initial reference binarizing level); the white and black dots are counted; and the ratios of white dots and black dots to the initial dots (= total pixels) are obtained; for example, if the ratio of white dots is higher, the board is identified as a "white" board; if the ratio of white dots is nearly equal to the ratio of black dots, the board is identified as a "gray" board; and if the ratio of black dots is higher, the board is identified as a "black" board.

[0217] Next, dimensions of each of the "white" boards, "gray" boards, and "black" boards are measured (steps S2, S4, and S6). As Figure 44 shows, the prerequisite for dimensional measurement is that the front deck boards 1 and front edge boards 1A, which are top boards for the wooden pallet P, are attached to 3 longitudinal beams 3; and since they are imaged from directly above, measuring the joint portion is difficult.

[0218] Thus, actual dimensional measurement is limited to the area subject for inspection shown in Figure 44. Figure 45 illustrates dimensional measurement of the front deck board 1_1, 1_2 and front edge board 1A.